# APPENDIX C
# NPSPAC CHANNEL PLANNING ANALYSIS

## C.1 Origins of the Regional Planning Process

The regional planning process began with the release of the National Plan. The regulations applicable to the process were provided in the Federal Communication Commission (FCC) *Report and Order in the Matter of Development and Implementation of a Public Safety National Plan and Amendment of Part 90 to Establish Service Rules and Technical Standards for Use of the 821-824/866-869 MHz Bands by the Public Safety Services (National Plan R&O)* released in December 1987. After the subsequent release of the *Memorandum Opinion and Order in the Matter of Development and Implementation of a Public Safety National Plan and Amendment of Part 90 to Establish Service Rules and Technical Standards for Use of the 821-824/866-869 MHz Bands by the Public Safety Services (National Plan MO&O)* in March 1988, the United States was split into 55 regions. At the direction of the *National Plan R&O*, each of the 55 regions formed regional committees to provide a forum that could examine local public safety communications requirements. The lengthy regional planning process began when the first regional plan was submitted by Region 8 in September 1988, and the initial planning process was completed when the last regional plan was submitted by Region 47 in December 1993.

Although the National Plan covered several key points required of every regional plan, the regulations allowed significant variation in the development of each regional plan. Thus, the regional planning process itself varies from region to region. However, close examination of the regional plans reveals many similarities among some plans as well as the processes used to develop those plans. The striking similarities among several of these plans warrant an analysis of each plan and an examination of any similarities and differences identified.

## C.2 "Template" Analysis of the Regional Plans

Upon review of a number of the regional plans, it was determined that the plans could be grouped by similarities in their structures. Based on these similarities, the plans and therefore their associated regions could be divided into six groups.

After each plan was assigned to a group, it became evident that the plans within a single group were more than remotely similar. All plans within a group seemed to have been created using the same "template" as other plans within that same group. It is assumed that the first regional plan submitted within a group is the plan that was used as a template for other plans within that same group. Therefore, the study team named each group after the region that submitted the first plan. Although it appears that other regions within a group acquired the original plan and modified it to suit their own requirements, each plan retained a significant amount of the originally accepted plan's requirements. After all the plans were grouped, it was clear that several did not match any template or follow any previous order. Therefore, these region's plans were placed in the sixth group labeled "Random." The following lists the regional plan template groups:

- *Group I* – Region 52, North Texas
- *Group II* – Region 8, New York City Metropolitan
- *Group III* – Region 54, Chicago Metropolitan
- *Group IV* – Region 7, Colorado
- *Group V* – Region 40, Dallas Metropolitan
- *Group VI* – Random.

Groups I through VI are depicted geographically in Figures C-1 through C-6, respectively. The italicized date near to each region number indicates the submittal date of that region's regional plan. If no submittal date could be found for a regional plan, *X*'s appear in place of a date. The number in parenthesis under the submittal date represents the total number of participants in that region's regional committee.

Examining each figure reveals several key attributes within each group. For instance, groups II, III, and IV consist of regions that are closely located geographically. Oklahoma, located in group II, is the only exception. Therefore, geographic proximity is determined to have been an important factor in similarities among regional plans.

The regions in group VI, the "Random" group, do not appear to have any characteristics in common. However, an analysis of FCC comments shows that these regions have been relatively active in the regional planning process. Entities that provided comments to the *Notice of Proposed Rulemaking in the Matter of Development and Implementation of a Public Safety National Plan and Amendment of Part 90 to Establish Service Rules and Technical Standards for Use of the 821-824/866-869 MHz Bands by the Public Safety Services (National Plan NPRM)* and the *National Plan R&O* documents are located in many of these regions. Because these regions played such active roles in the planning process, it is understandable that these regions would take the time to develop their own individual regional plans.

Group I is similar to group VI in that the groups consist of regions that are somewhat scattered throughout the United States. The first plan submitted was from group I, Region 52 (North Texas), which may explain why the small group of regions bordering Region 52 used the same template. A reason why more distant regions used the same template can be found in their history of participation in the regional planning process—only a few of these regions contain public safety entities that provided comments to the *National Plan NPRM* and the *National Plan R&O* documents. As a whole, group I began developing regional plans a few years after the other groups began the process and did so in a very short time frame compared with regions in other groups. In addition, lack of participation is evidenced by the fact that, on a region-by-region basis, group I contains the fewest regional committees members. It also appears that each of these regions efficiently streamlined their own planning processes. In light of these facts, these regions belong in the same group.

## C.3 Regional Committee Membership

The National Plan recommended the formation of regional committees with regional chairmen elected from among the committee membership. The National Plan allowed each region

a great deal of freedom in determining eligible participants for the regional committee. Analysis of the demographics of the regional planning committees provides another aspect on which to base an analysis of the regional planning process. Tables C-1 through C-6 list the membership of each regional committee, categorized by the departments. Each table represents a group, I through VI.

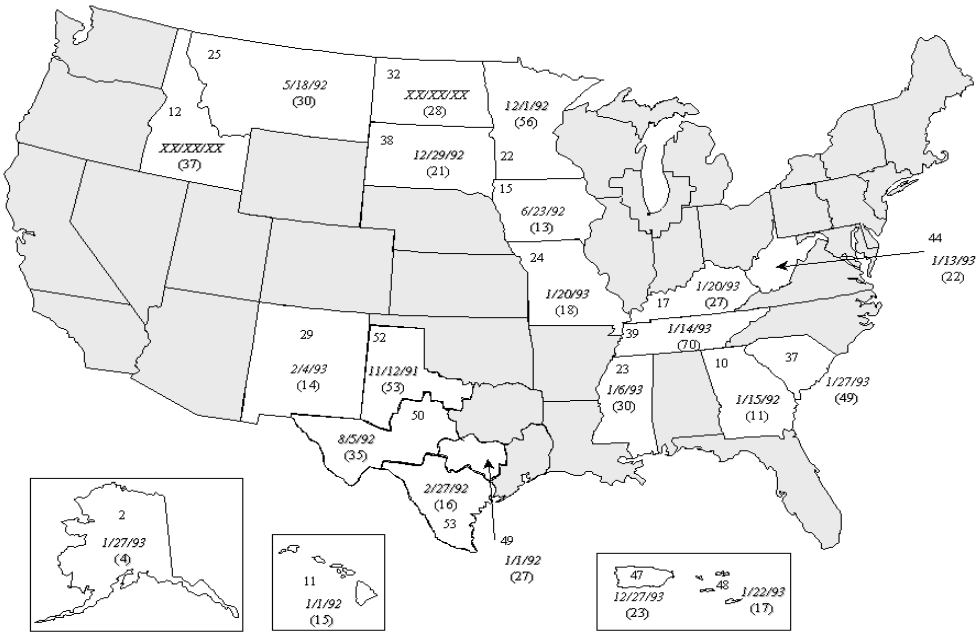


**Figure C-1**
**Regional Breakdown of United States—Group I**

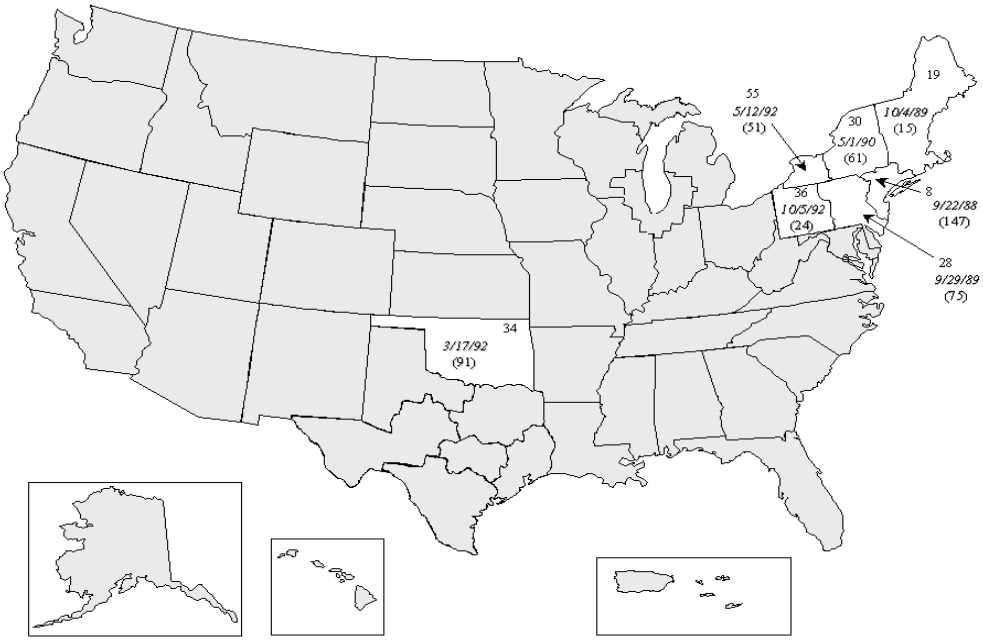


**Figure C-2**
**Regional Breakdown of United States—Group II**


**Figure C-3**
**Regional Breakdown of United States—Group III**

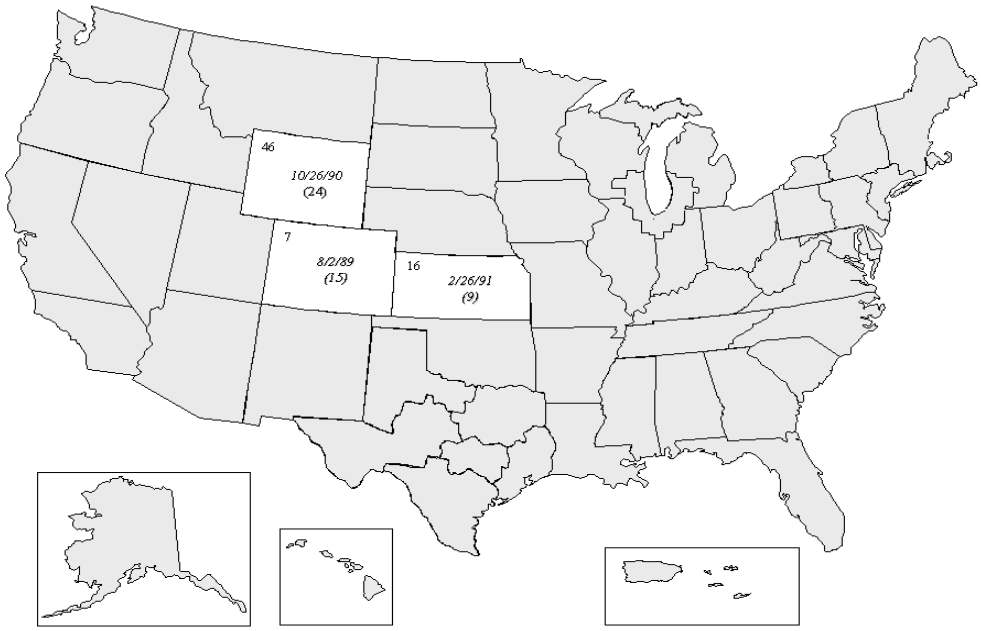


**Figure C-4**
**Regional Breakdown of United States—Group IV**

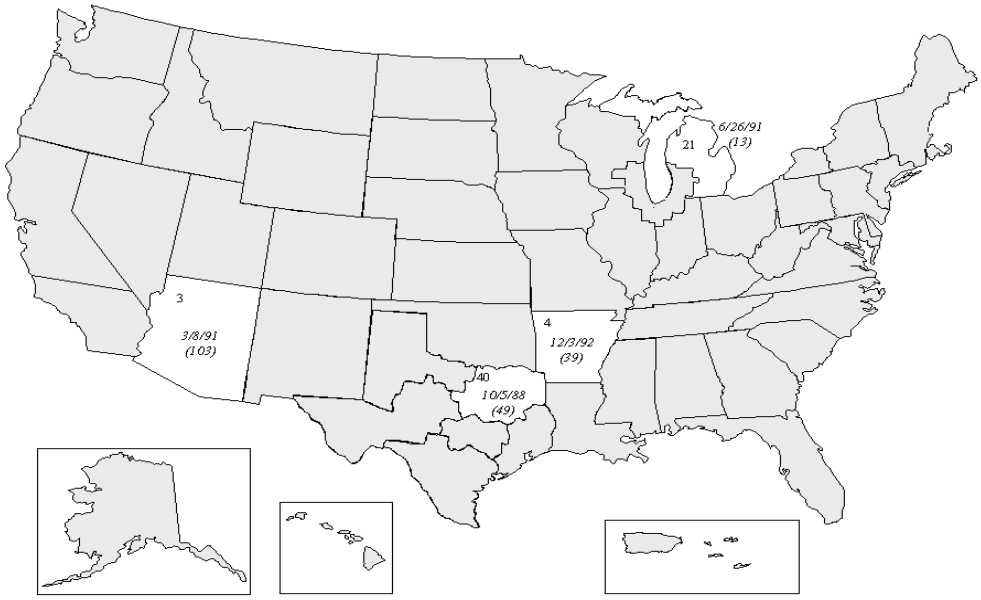


**Figure C-5**
**Regional Breakdown of United States—Group V**

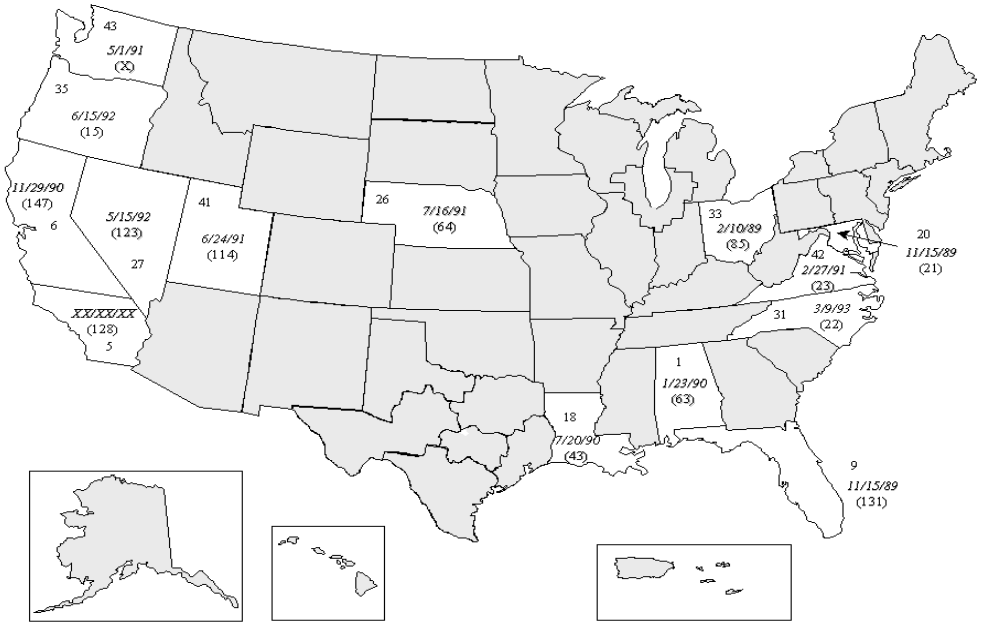


**Figure C-6**
**Regional Breakdown of United States—Group VI**

Throughout all regions, the majority of regional committee membership consists of police department representatives, fire department/emergency medical services (EMS) representatives, and representatives from county, state, and some federal government agencies. The category labeled "Other" consists of representatives from the local department of transportation, local forestry/conservation agencies, and other various local entities. The vast majority of regional committees did not include any APCO representatives.

These tables also highlight the level of committee participation in each region. Regions in group VI had high levels of representation from many different departments. This high degree of attendance could be due to extensive advertisement of the regional committee meetings, the perceived importance of obtaining additional frequencies for public safety, or both. No regional committee membership data was provided for those regions marked with an *X*.

**Table C-1**

## Regional Committee Membership Listed by Department (Group I)

| REGION | POLICE | FIRE/EMS | GOVERNMENT | INDUSTRY | ACADEMIA | APCO | OTHER |
|---|---|---|---|---|---|---|---|
| 2 | 0 | 1 | 3 | 0 | 0 | 0 | 4 |
| 10 | 4 | 1 | 3 | 1 | 0 | 0 | 3 |
| 11 | 5 | 4 | 3 | 0 | 0 | 0 | 3 |
| 12 | 22 | 1 | 7 | 6 | 0 | 0 | 1 |
| 15 | 6 | 1 | 4 | 1 | 0 | 0 | 1 |
| 17 | 9 | 4 | 8 | 3 | 0 | 0 | 9 |
| 22 | 1 | 2 | 45 | 7 | 0 | 0 | 1 |
| 23 | 4 | 7 | 11 | 3 | 0 | 0 | 5 |
| 24 | 4 | 9 | 2 | 0 | 0 | 0 | 3 |
| 25 | 4 | 8 | 7 | 3 | 1 | 0 | 7 |
| 29 | 4 | 3 | 4 | 0 | 0 | 0 | 3 |
| 32 | 4 | 7 | 2 | 5 | 1 | 0 | 9 |
| 37 | 9 | 5 | 25 | 2 | 1 | 0 | 7 |
| 38 | 6 | 1 | 5 | 4 | 0 | 0 | 5 |
| 39 | 7 | 17 | 15 | 16 | 3 | 0 | 12 |
| 44 | 3 | 3 | 6 | 6 | 0 | 1 | 3 |
| 47 | 3 | 2 | 12 | 4 | 0 | 0 | 2 |
| 48 | 3 | 2 | 6 | 3 | 0 | 0 | 3 |
| 49 | 2 | 4 | 7 | 3 | 0 | 0 | 11 |
| 50 | 7 | 4 | 14 | 3 | 0 | 0 | 7 |
| 52 | 23 | 15 | 13 | 0 | 0 | 0 | 2 |
| 53 | 5 | 2 | 9 | 0 | 0 | 0 | 0 |
| AVG | 6 | 4 | 9 | 3 | 0 | 0 | 4 |

## Table C-2
## Regional Committee Membership Listed by Department (Group II)

| REGION | POLICE | FIRE/EMS | GOVERNMENT | INDUSTRY | ACADEMIA | APCO | OTHER |
|---|---|---|---|---|---|---|---|
| 8 | 55 | 30 | 27 | 16 | 0 | 1 | 18 |
| 19 | 4 | 5 | 1 | 4 | 0 | 0 | 1 |
| 21 | 5 | 2 | 5 | 0 | 0 | 0 | 1 |
| 28 | 11 | 8 | 24 | 18 | 0 | 0 | 14 |
| 30 | 20 | 11 | 8 | 16 | 0 | 1 | 5 |
| 34 | 45 | 3 | 21 | 5 | 1 | 0 | 16 |
| 36 | 2 | 1 | 12 | 0 | 0 | 0 | 9 |
| 55 | 24 | 13 | 5 | 5 | 0 | 0 | 5 |
| AVG | 20 | 9 | 12 | 8 | 0 | 0 | 8 |

## Table C-3
## Regional Committee Membership Listed by Department (Group III)

| REGION | POLICE | FIRE/EMS | GOVERNMENT | INDUSTRY | ACADEMIA | APCO | OTHER |
|---|---|---|---|---|---|---|---|
| 13 | 19 | 7 | 11 | 6 | 1 | 1 | 6 |
| 14 | 56 | 11 | 6 | 5 | 3 | 0 | 5 |
| 45 | X | X | X | X | X | X | X |
| 54 | 37 | 13 | 10 | 12 | 0 | 2 | 16 |
| AVG | 37 | 10 | 9 | 8 | 1 | 1 | 9 |

## Table C-4
## Regional Committee Membership Listed by Department (Group IV)

| REGION | POLICE | FIRE/EMS | GOVERNMENT | INDUSTRY | ACADEMIA | APCO | OTHER |
|---|---|---|---|---|---|---|---|
| 7 | 3 | 2 | 7 | 2 | 0 | 0 | 1 |
| 16 | 2 | 1 | 3 | 0 | 0 | 1 | 2 |
| 46 | 6 | 5 | 6 | 3 | 0 | 0 | 4 |
| AVG | 3 | 2 | 5 | 2 | 0 | 0 | 2 |

## Table C-5
## Regional Committee Membership Listed by Department (Group V)

| REGION | POLICE | FIRE/EMS | GOVERNMENT | INDUSTRY | ACADEMIA | APCO | OTHER |
|---|---|---|---|---|---|---|---|
| 3 | 43 | 27 | 23 | 5 | 1 | 1 | 3 |
| 4 | 12 | 10 | 3 | 3 | 0 | 0 | 11 |
| 40 | 13 | 5 | 19 | 8 | 1 | 0 | 3 |
| AVG | 23 | 14 | 15 | 5 | 1 | 0 | 6 |

**Table C-6**
**Regional Committee Membership Listed by Department (Group VI)**

| REGION | POLICE | FIRE/EMS | GOVERNMENT | INDUSTRY | ACADEMIA | APCO | OTHER |
|---|---|---|---|---|---|---|---|
| 1 | 17 | 8 | 17 | 10 | 3 | 0 | 8 |
| 5 | 33 | 16 | 60 | 0 | 10 | 0 | 9 |
| 6 | 15 | 25 | 82 | 13 | 4 | 0 | 8 |
| 9 | 44 | 19 | 41 | 12 | 0 | 0 | 15 |
| 18 | 13 | 5 | 8 | 14 | 0 | 0 | 4 |
| 20 | 4 | 4 | 9 | 0 | 0 | 0 | 5 |
| 26 | 18 | 14 | 20 | 2 | 3 | 0 | 7 |
| 27 | 38 | 28 | 35 | 1 | 0 | 0 | 21 |
| 31 | 5 | 4 | 8 | 5 | 0 | 0 | 0 |
| 33 | 17 | 13 | 23 | 16 | 3 | 0 | 13 |
| 35 | 4 | 0 | 6 | 0 | 0 | 1 | 4 |
| 41 | 46 | 8 | 23 | 5 | 6 | 0 | 29 |
| 42 | 3 | 6 | 6 | 6 | 0 | 0 | 2 |
| 43 | X | X | X | X | X | X | X |
| AVG | 20 | 12 | 26 | 7 | 2 | 0 | 10 |

## C.4 Key Regional Plan Similarities

In developing regional plans, each regional committee's task was to determine the communications requirements of local public safety entities while coordinating its efforts with adjoining regions. Despite the intention to create independent, specialized regional plans, several key similarities appear in all regional plans. These similarities are generally consistent from one region to the next and from one group to the next. The first step in understanding the regional planning process at the local level is to understand these common sections. The section headings were standardized across the 55 regional plans. The similarities in these plans were generally in the following standardized sections:

- Preface
- Plan Development
- Agency Application Process
- Mutual Aid Requirements
- System Design Requirements
- Frequency Assignment.

Each of these headings contains several subheadings, which specifically describe each aspect of the regional plan. Many of the sections in the regional plans are required by the National Plan and are designated by the plan section number from which they were taken.

### C.4.1 Preface

Each regional plan begins with a preface section, which includes a few introductory comments. This section generally provides historical background information. All of the regional plans contain some form of introduction, which typically provides the background of the NPSPAC and the National Plan. In many cases, a short history of the NPSPAC channels is provided as well as a short description of the National Plan.

### C.4.2 Plan Development

The introduction portion of each regional plan is typically followed by sections that provide details of the regional plan development process. These sections address such issues as forming the regional committee, determining eligible committee participants, and defining the committee's goals.

**Regional Planning Committees**. This subsection provides details about the formation of the regional planning committees. In this subsection of the regional plan, the committee provides the name of the first meeting convenor, who is selected by APCO and serves as the coordinator of the planning process. The *National Plan R&O* states APCO, "acting under its frequency coordination responsibilities, will be responsible for convening a meeting to initiate the planning process in each region." Therefore, APCO was instructed to select a convenor for each region whose responsibilities would include organizing and publicizing the first planning meeting. A typical regional committee comprises representatives from public safety radio services and special emergency radio services. Section IV.B of the National Plan proposes the formation of regional committees.

**Eligible Agencies.** This subsection states that any entity eligible to be licensed under the FCC Rules and Regulations, Part 90, Subparts B or C (Public Safety Radio Services and Special Emergency Radio Services) is eligible to apply for NPSPAC channels. The requirements of this subsection were taken from the National Plan, Section III.B.

**National Interrelationships.** Each regional plan expresses its observance of the guidelines set forth in the National Plan and explains that any conflicts between the National Plan and regional plans will be governed by the National Plan. Each regional plan states that conflicts between regions are expected, but the judgment of the FCC would prevail in any of these conflicts.

**Federal Interoperability**. Interoperability between local, state, and federal agencies will take place primarily on the five common channels using S160[1] or equivalent agreements. Government use of non-government systems using S160 agreements must comply with FCC Rules and Regulations, Section 2.103. Nonfederal licensees can increase channel requirements to account for a 2 to 10 percent increase in mobile radios from federal agencies.

[1] The S160 is a special record note applied to the Federal Government frequency assignment that applies the conditions under which the Federal Government may obtain authorization to use a non-Federal Government frequency.

### C.4.3 Agency Application Process

This section provides information about which agencies are given priority in applying for available channels. This section also describes the application process to which these agencies must adhere.

**Application Procedures**. Regional plans require that applications be submitted to the local frequency advisory committee chairman (usually the APCO frequency coordinator). The chairman inspects each application for completeness and determines the eligibility of the applicant. Incomplete or unsuitable applications are returned with remarks to the applicant, and complete applications are forwarded to the review committee.

**Required Application Information.** Many regions require other information in addition to the frequency application form (APCO Form FDR2). The following list includes all additional information requested in regional applications:

- System overview (e.g., trunked or conventional, voice, data)
- Service duties of agency
- System engineering exhibit and design parameters
- Intersystem interoperability capability
- Channel loading factors
- Coverage area
- Existing and vacated frequencies statement
- Implementation plan and/or schedule
- Coordination and licensing forms
- Funding statement and/or budgetary commitment
- Interface with long-distance radio
- Statement of need
- Compliance with common channel implementation requirements
- Interference studies
- Control station exhibit
- Special consideration.

**Agency Priority.** Two methods are used to assign a priority to applicants. The first method which is relatively simple, assigns a priority based on the type of agency and the type of system used. The following criteria are used in this method:

- Public safety agencies
- Public service agencies
- Multi-agency systems
- Multi-agency/multi-jurisdiction systems
- Single agency/jurisdiction systems.

The second, more complex method, uses an evaluation matrix to assign a priority based on a number of criteria. Each region includes different criteria with different point values based on which aspects are most important. The following categories are used in this second method. These categories are listed in a random order and do not reflect a priority assigned to each element:

- Service
- Intersystem communications
- Loading
- Spectrum-efficient technology
- System implementation factors
- Geographic efficiency
- Give-backs
- Combined systems
- Budgetary commitment
- Planning completeness
- Channel reuse potential
- Jurisdictional concurrence
- Responsibility for calculations
- Frequency reuse statement
- Number of give-back channels
- Effective system design
- Consolidation or use of channels by others.

### C.4.4 Mutual Aid Requirements

The National Plan requires that regional plans contain several sections concerning the implementation of the five nationwide mutual aid channels. These sections typically define the use of each of these channels and provide detailed standards and operating procedures to govern the use of these channels.

**Common Channel Implementation**. The National Plan sets forth the guidelines for using and implementing the five National Common Channels. Four of these channels are dedicated as National Tactical Channels and one channel is dedicated as the National Calling Channel. The National Calling Channel, channel 601, is to be implemented as a full mobile relay, with wide area coverage transmitters to maximize coverage. Large system users (five or more channels) are required to monitor this channel and could be required to provide satellite receiver feeds into the wide coverage area. The four National Tactical Channels are to be assigned throughout the region for use by all eligible entities. Large system users could be required to sponsor one or two localized mobile relays to cover specific geographic areas. The users of these channels must be eligible for licensing on other 800 MHz public safety channels (FCC Rules and Regulations Section 90.616 (a)), but no special licensing is required. The National Common Channels are to be available for use throughout the region. Table C-7 lists the National Common Channels and each channel's specific frequency.

**Table C-7**
**National Common Channels**

| Channel Name | Channel Number | Frequency (Mobile/Base in MHz) |
|---|---|---|
| CALL | 601 | 821.0125 / 866.0125 |
| TAC 1 | 639 | 821.5125 / 866.5125 |
| TAC 2 | 677 | 822.0125 / 867.0125 |
| TAC 3 | 715 | 822.5125 / 867.5125 |
| TAC 4 | 753 | 823.0125 / 868.0125 |

**Operation on Common Channels**. The five common channels are only to be used for activities requiring intersystem communications between entities not already sharing communications systems and are not to be used for any daily operations. In emergencies, the channels may be assigned by the primary public safety agency in that area. On all common channels, plain English and familiar words and phrases should be used. The calling channel is used to establish contact with other users and determine which tactical channel to use. It is not to be used as an ongoing working channel. Tactical channels are reserved for inter-agency communications and are used as directed by the primary public safety agency in the area. Tactical channels can be assigned by the various public safety services or they can be assigned by county or area.

**Network Operating Method**. A wide area network will be established on the National Calling Channel. The tactical channel communications systems will be implemented by volunteer entities, and each primary geographic section of the region is covered by at least one tactical channel.

**Coded Squelch on Mutual Aid Channels**. The National Common Tone Squelch of 156.7 Hz will be used on all equipment operating on the five common channels. This requirement is proposed in the National Plan, Section III.C.2.

### C.4.5 System Design Requirements

Several sections in each regional plan define the specific system design requirements. The content of these sections depends on the region's particular communications requirements. Even among regions in the same group, these plan sections are typically the most diversified with respect to the content and requirements.

**System Coverage**. System coverage is limited to the coverage area plus no more than 3 miles (5 miles for some regions) beyond coverage area boundaries and is included in the regulations to maximize frequency reuse. The system coverage area is defined as the area in which the received signal strength of a system signal is greater than 40 dBu (41 dBu for some regions). In most cases, the coverage area should be similar to the jurisdiction of the agency in question. Systems that use antennas that are not in the center of the jurisdiction are encouraged to use directional antennas to contain the coverage area. The FCC provides guidance for the calculations in the FCC Rules and Regulations, Section 90.309 (a) (4). The following four variables are used to determine a system's coverage area:

- *Received Signal Strength*—Minimum signal level at system boundary in dBu (same as designed mean signal strength described in the previous paragraph)

- *Antenna Height*—Height above average terrain (HAAT) surrounding the antenna site

- *Effective Radiated Power (ERP)*—Product of the power supplied to the antenna and its gain relative to a half wave dipole

- *Environment Type*—The Okumura/Hata[2] method uses the following four different classifications to describe terrain:

  – Urban: Built-up city with large buildings or closely interspersed houses with thickly grown trees

  – Suburban: City or highway scattered with trees, houses, and other mid-sized buildings

  – Quasi-Open: Outside city limits with few buildings and houses

  – Open: No obstacles such as tall trees or buildings

**Trunking/Usage Guidelines**. Systems with five or more channels must be trunked, and systems with four or fewer channels may be conventional. The FCC allows exceptions on a case-by-case basis if it can be shown that an alternative technology is as efficient as trunking or that trunking would not meet operational requirements. Conventional systems of four or fewer channels that do not meet FCC loading standards must share their frequency with others operating on the same channels. Smaller 800 MHz conventional systems must not interfere with the region's trunked system. Also, communications systems supporting life and property protection receive the highest priority, therefore interference with these systems must be minimized. Antenna heights and ERP are to be limited to provide only necessary coverage and to facilitate maximum frequency reuse. Separation of co-channel transmitters will not be held to 70 miles; instead, separation will be determined by the applicant's coverage needs. The National Plan, Section III.C.3, requires the elements of this subsection.

**Channel Loading Requirements.** Another similarity between most plans is that of channel loading. The following list indicates the variety of statements regarding channel loading found in the regional plans:

- Entities using conventional systems and requesting a new 800 MHz channel to replace a channel they are giving back for reassignment, will not be required to meet loading requirements to obtain that channel. However, if the system is not loaded to 50 or

[2] The Okumura/Hata method provides a means for determining the terrain surrounding an antenna site.

more units (70 for some regions), that frequency will be available to other entities on a shared basis (Source: FCC Rules and Regulations, Section 90.633).

- Entities that use trunked 800 MHz systems or are requesting multiple 800 MHz channels must comply with the loading tables provided in the National Plan. These loading tables are given in terms of emergency and non-emergency channels (Source: FCC Rules and Regulations, Section 90.631).

- Entities requesting additional 800 MHz channels must show the existing channels are 100 percent loaded in terms of the number of units assigned per channel. If a demand for additional channels exists with no available frequency, any system using these frequencies for 4 or more years and not loaded to 70 percent will lose a sufficient number of channels. These released frequencies can then be reassigned to other public safety entities.

- Additional channel requests can also be justified through a traffic loading study. The study must show "air-time" usage during the peak busy hours greater than 70 percent per channel on 3 consecutive days to justify the need for additional channels.

- Entities that support interoperability by permitting federal use of their frequencies through S160 agreements may augment channel requirements by 2 to 10 percent due to increased radio usage.

**Encryption Standards.** Encryption is encouraged for entities that conduct covert operations and require communications security. It is recommended that encrypted transmissions be in a digital format using an analog-to-digital converter with a bit rate that will fit in a 25 kHz channel. Encryption is prohibited on the National Calling Channel. Encryption is allowed on the tactical channels but is not recommended due to system incompatibilities. If an agency requires encryption on the tactical channels, it must provide the needed equipment to compensate for system incompatibilities and maintain interoperable communication on these channels.

**Use of Cellular Service.** Automatic interface to the public switched telephone network (PSTN) using 800 MHz radio requires longer channel use than normal transmissions. Using cellular telephones to connect to the PSTN is recommended instead of an 800 MHz interface, especially when duties require connection to the PSTN. The use of automatic interconnection of 800 MHz radio to the PSTN is not recommended. The use of cellular telephones for this purpose is recommended in the National Plan, Section V.B.

**Use of Long-Range Communications.** In situations requiring long-range communications into a disaster area, alternate methods should be determined by the region's primary public safety agency. These alternate methods should be capable of interfacing with the National Common Channels.

**Expansion of Existing Systems.** Existing systems that will be expanded to include the NPSPAC channels will have their mobile radios "grandfathered," if the modifications conform with the

*National Plan MO&O*, FCC GEN. Docket 87-112. These requirements primarily involve reducing the modulation deviation to +/- 4 kHz. Existing base stations in the 806–821/851–866 MHz frequency band may *not* be used in the NPSPAC frequency bands. This requirement is cited in Section III.C.2 of the National Plan.

**Slow Growth.** All entities implementing systems in the NPSPAC bands and following the regional planning process will be allowed to follow slow growth provisions in accordance with Section 90.629 of the FCC's Rules and Regulations. These rules allow those requesting frequencies to take up to five years to construct a system.

**Adjacent Region Coordination.** As part of the planning process, each region coordinated with adjacent regions. Letters of coordination sent to adjacent regions may be included in an appendix to the regional plan. Section IV.B.8 of the National Plan requires inter-regional cooperation and coordination.

**Channeling Plan.** As required by Section III.C.1 of the National Plan, any system licensed in the NPSPAC bands must have a 25 kHz channeling plan.

### C.4.6 Frequency Assignment Process

Typically, the last several sections of each regional plan provide information about the assignment and frequency review processes.

**Application, Assignment, and Review Process.** The application, assignment, and review processes typically include a filing window for submitting applications, an evaluation matrix for prioritizing applicants, and a method for assigning the frequencies, respectively. A flow chart may be included to outline this process in detail. The National Plan recommended these processes in Sections IV.B.6 and IV.B.7.

Regional plans typically include a frequency assignment table with the channel number, frequency, and assignee. Many regions also include other regional mutual aid and regional non-mutual aid channels in their tables.

**Additional Channel Assignments.** Many regional committees made frequency assignments based on county population (e.g., two channel pairs per county). Counties with higher populations were allotted one channel for each additional increment of population (e.g., counties above 20,000 receive one channel pair for each additional 20,000 citizens). This method provided a basis for the initial frequency assignment. The development of a channel assignment process is stated in Section III.C.2 of the National Plan.

**Frequency Sorting Methodology.** The development of some form of frequency sorting method was recommended in the National Plan, Sections IV.B.5 and IV.B.9. Most regional plans specify that frequencies be assigned by a frequency-sorting program designed by APCO/CET. This program has a high degree of spectrum efficiency and a low probability of co-channel and adjacent channel interference. The following factors are considered by the APCO/CET program:

- *Geographic area.* Geographic area is defined as one or more circles of equal radius. These circles should ideally include an applicant's entire jurisdiction area but should not exceed the jurisdiction boundary by 3 miles.

- *Environment.* Environment is defined by the Okumura/Hata method of classification.

- *Blocked Channels.* The five National Common Channels and any other regionwide mutual aid channels that are spaced at 0.5 MHz intervals and excluded from the frequency sort.

- *Transmitter Combining.* The program provides a minimum frequency separation between channels assigned at the same site to enable efficient combining of multiple transmitters to a single antenna.

- *Special Considerations.* Licensees planning to expand systems that are unable to operate on 12.5 kHz separated carrier frequencies may operate on only even-numbered channels.

- *Interference Protection Ratios.* Built into the computer program. The co-channel ratio gives the desired-to-undesired signal ratio (in dBu) for co-channel assignments, and the adjacent channel ratio gives the same for adjacent channel assignments. Normal ratios are 35 dBu for co-channel assignments and 15 dBu for adjacent channel assignments.

- *Adjacent Region Considerations.* The program requires a list of channels to be blocked because of use by adjacent regions.

**Give–Back Frequencies.** As required by the National Plan, Section V.A.1, any agency using the new 800 MHz spectrum should submit a plan of abandonment for current licensed frequencies in the lower bands. These frequencies will then be made available to agencies that are not moving to 800 MHz or returned to the radio service to which they were originally assigned. Frequencies are not to be handed down within a jurisdiction but should be reassigned in the proper and normal manner. Time frames for phasing into 800 MHz should be included.

**Unused Spectrum.** Any unused 800 MHz frequencies will be returned to a reserve pool, which will be used to resolve conflicts with adjacent regions and to fill any additional public safety communications needs (Source: National Plan, Section V.A.2).

**Appeal Process.** As proposed in the National Plan, Section V.A.2, an applicant can appeal an assignment or rejection with the regional review committee and the FCC. If the appeal reaches the FCC, its decision will be final.

## C.5 Key Regional Plan Differences

The previous discussions outlined common sections among the regional plans. Although there are many similarities between the groups of plans, there are also significant differences. This section outlines differences discovered among the five definable groups of regional plans as well as the significant differences found among individual regional plans in the "random" group. Many of these differences are elements that were included in some regional plans but not others. This section presents the differences in much the same manner as the similarities were presented. The differences are organized into sections that follow the structure of the regional plans. Again, section headings were standardized across the 55 regional plans. Using this same organization should facilitate a comparison of the similarities and differences discovered among the regional plans. The differences in these plans were generally in the following standardized sections:

- Plan Development
- Region Description
- Agency Application Process
- Mutual Aid Requirements
- System Design Requirements
- Frequency Assignment Process.

### C.5.1 Plan Development

This portion of the regional plan addresses such issues as forming the regional committee, determining eligible committee participants, and defining committee goals. The differences found among the regional plans are highlighted and explained in the following sections.

**Regional Planning Committee Member Demographics.** The backgrounds of each regional planning committees' members vary among regions. The diverse demographics of the regional committees did not appear to follow any recognizable pattern. A further analysis may be needed to examine the relationship between committee demographics and frequency assignment (e.g., a committee with a majority of state police members might assign more channels to the state police). Tables C-1 through C-6 in Section C.3 show the committee demographics of each region.

**Previous Existing Interoperable Systems.** Three regional plans mention interoperable systems currently in place. These regions are Region 5 (Southern California), Region 6 (Northern California), and Region 27 (Nevada). California has implemented a Statewide Mutual Aid Radio System (SMARS) to establish interoperable channels throughout the state and in various frequency bands (e.g., VHF and low-band UHF). This system includes 14 mutual aid channels: six statewide high-band VHF, one statewide UHF, and seven county area UHF mutual aid channels. Also, cross-band patches are used by many dispatch centers to patch the various channels together.[3] Nevada has existing interagency frequencies in the 150 MHz range. Table C-8 lists the frequencies and usage of each of these channels.

**Table C-8**

[3] *Region 5 Public Safety Plan*

**Nevada Existing Inter-Agency Frequencies**

| Channel | Frequency (MHz) | Usage |
|---|---|---|
| State 1 | 154.280 | Fire |
| State 2 | 154.265 | Fire |
| State 3 | 154.295 | Fire |
| State 4 | 155.145 | Division of Emergency Management (Simplex) |
| State 5 | 155.715 | Division of Emergency Management * |
| State 6 | 155.475 | Federal Law Enforcement |
| State 7 | 155.655 | State Law Enforcement |
| State 8 | 155.160 | State Search and Rescue |
| State 9 | 156.075 | State Incident Command |
| State 10 | UHF | Future Assignment |
| State 11 | UHF | Future Assignment |

*State 5 is a repeater control frequency paired with State 4.

**Questionnaire Development.** As part of the planning process, some regional committees used a questionnaire to identify radio spectrum needs and elicit meaningful information on current and future spectrum needs. Regions 3, 9, 13, 14, 21, 26, 27, 35, 41, and 54 included some form of questionnaire in their plans. Most of the regions in group III (regions 13, 14, and 54) and regions 21, 26, and 41 all sent out similar questionnaires, which included the following sections:

- *General Information*—Agency identification information
- *Demographic Information*—Agency's service area information
- *Frequency Needs*—Information regarding the use of radio frequencies for voice and data
- *Equipment*—Radio equipment inventory information.

These regions also included a discussion of the results with information and statistics. The questionnaires contained about 50 questions, mostly of the *yes* or *no* variety. It should be noted that Region 45, which belongs to group III, did not send out a questionnaire but did send representatives to talk with public safety radio users. Region 3 sent out a simple, one-page questionnaire to determine who desired public safety radio channels. Region 9 included a similar questionnaire with four sections, including general information, agency frequency use, additional information, and license information. Region 27 included extensive information about existing state and local antennas on mountaintops, state and local equipment inventories, and state and local interoperability requirements. Region 35 performed a survey of current use, expectations of future 800 MHz needs, and return of frequencies for reuse. This survey revealed very little interest in 800 MHz, except in the Portland area, and it generated many questions about additional spectrum in lower bands.[4]

4 *Region 35 Public Safety Plan*

### C.5.2 Region Description

Several regional plans contain a series of sections that provide details on the demographics of the region, as well as a geographical description of the area. These are not considered key sections because the majority of regional plans provide only sparse regional information and little emphasis is placed on this portion of the plan. However, a description of the differences among plans may be helpful.

**Region Defined.** In regions containing dense urban areas, it was believed to be necessary to subdivide the region into zones. Primary zones are jurisdictions that are severely affected by excess demand for scarce spectrum. Secondary zones are general areas that are affected to a lesser degree. Regions 8, 14, 19, 21, 33, and 54 identified primary and secondary zones within their regions.

### C.5.3 Agency Application Process

As stated in the discussion of the regional plans' key sections, the following sections provide information about which entities are given priority in applying for available frequency bands and about the application process to which these entities must adhere.

**Agency Priority.** As stated previously, there are two major methods of prioritization, both based on point systems. The first method was used by group I and prioritizes applicants by service and type of system. The plan priority for group I states that "Prioritization shall be done according to a final score, based on applicant criteria. The highest score, in points, shall be given priority in a situation where spectrum is insufficient to fulfill the needs of all." Within group I, Region 11 followed a different point-scoring scheme, which is also presented in Table C-9.

The second method, used by most other regions, applies a list of criteria to assign priority. A priority evaluation matrix is used to assign points for the following categories, and the agency with more points is given higher priority:

- Service
- Intersystem communications
- Loading
- Spectrum–efficient technology
- System implementation factors
- Geographic efficiency
- Give-backs
- Combined systems (points per additional agency).

**Table C-9**
**Agency Priority (Method 1)**

| Criteria | Points (Group 1) | Points (Region 11) |
|---|---|---|

| | | |
|---|---|---|
| Public Safety Agencies | 2 | 4 |
| Public Service Agencies | 1 | 2 |
| Multi-Agency Systems | 2 | 3 |
| Multi-Agency/Multi-Jurisdiction Systems | 3 | 1 |
| Single Agency/ Jurisdiction Systems | 1 | 1 |

### C.5.4 Mutual Aid Requirements

The mutual aid channel sections of the regional plans are required by the National Plan. The regional plans fulfill this requirement in several different ways.

**Tactical Channels (National or International).** Many regional plans assign usage for each tactical channel in one of two ways. Group I (except for Region 44) and Regions 3 and 27 assign the channels by service, as shown in Table C-10. Whereas, Regions 1, 21, 28, 30, and 36 assign the four tactical channels by county or area of the region. Regions 28 and 36 include a table with primary and secondary tactical channel assignments by county.

**Table C-10**
**Tactical Channel Assignments (Method 1)**

| Channel | Assignment (All But Region 25) | Assignment (Region 25) |
|---|---|---|
| ITAC 1 | Law Enforcement | Highest Level of Operational Command |
| ITAC 2 | Fire | Highest Level of Law Enforcement Command |
| ITAC 3 | Emergency Services | Highest Level of Fire Command |
| ITAC 4 | Command and Control | Highest Level of EMS command |

**Operational Requirements.** Regions 1 and 9 require that each major user of five or more channels sponsor one or two localized conventional relays to cover specific areas to provide a fixed number of working channels in the given area.[5] Regions 42 and 44 require only that primary system users (five or more channels) monitor the calling channel and maintain a radio watch at all times.

Group IV and Regions 4, 18, 31, 35, 40, and 43 divide users into two categories: primary and secondary users. Primary users are agencies that operate on five or more channels. They are required to operate a receiver for continuous monitoring of the calling channel and a separate mobile relay base station equipped to operate on all five tactical channels. All primary users will maintain a radio watch on the calling channel for the purpose of monitoring the channel and rendering assistance. Secondary users are agencies that operate on four or fewer channels and are required, as a minimum, to operate a base station for continuous monitoring of the common channel.

[5] *Region 1 Public Safety Plan*

**Mutual Aid Channels.** Several regions included additional requirements concerning the mutual aid channels:

- *Voice Privacy, Paging, Alerting, and Signaling.* Regions 5, 26, 27, and 35 mandate that voice privacy, paging, alerting, and signaling are prohibited on the common channels. However, Regions 5 and 27 state that encryption or voice privacy may be allowed on tactical channels in unique circumstances.

- *Unit Identification.* Regions 3, 5, 16, 26, and 27 require that units operating on the mutual aid channels include their agency names in their unit identifications. All but Region 27 encourage Automatic Transmitter Identification System (ATIS) usage; however, voice identification is still required.

- *Cross-Band Repeating.* Regions 5, 16, 25, 26, and 27 permit agency or mutual aid channels outside the 800 MHz spectrum to link to the national common channels in accordance with FCC rules and regulations. This cross-band repeating is to be used to provide interoperability among users on different radio bands.

- *Mutual Aid Channels Priority Usage.* Many regions set up priority communications levels for the mutual aid channels. When a higher priority use is required, all lower priority use must cease in any area where interference could occur.

- *Subregions.* All regions in group II (except for Region 30) and Regions 1 and 7 are broken into subregions that conform to political boundaries in the region. Each of these, except Regions 7 and 34, must have a primary public safety dispatch center operating a base station on the CALL and TAC1-4 channels.

- *Primary Network Control Centers.* Group III and eight other regions established a Primary Network Control Center in each area to monitor the national calling channel. This center responds to calls for assistance within its area and coordinates the assignment of the tactical channels for ongoing emergency operations.

- *Cross System Patches.* Group III includes the following section regarding cross system patches:

  - Cross system patches to existing day-to-day systems, other mutual aid channels, or long range communications systems must be manually controlled. Automatic patches are not permitted. Cross system patches are normally handled by the Primary Dispatch Center in the section of the region involved.

- *Coded Squelch on Mutual Aid Channels.* Groups I, IV, and V and a few other regions require that all equipment with the capability to operate on the five common channels be equipped with the National Common Tone Squelch of 156.7 Hz, as recommended by the FCC. Group I states that mobile relays on the common channels

may use additional tone or digital squelch to select individual mobile relay stations, provided the National Common Tone Squelch Code is used on the output.

### C.5.5 System Design Requirements

This portion of the regional plans proved to be the most diverse among the regions. The differences arise due to the unique geography and demographics of each region.

**System Coverage Definition.** Almost all regional plans include a section concerning the system coverage definition, which is required in the frequency assignment process. The system coverage is typically defined as a dBu value (dB above one microvolt per meter), which represents the maximum designed mean signal strength at a certain distance outside the boundary of the agency's jurisdiction. This signal strength for each region is either 40 dBu or 41 dBu, and the distance outside the boundary is either 3 or 5 miles. This limitation of signal coverage is designed to maximize frequency reuse. Groups I and V also discuss the determination of system coverage area according to the following four variables (three variables for group V):

- *Received Signal Strength*—Minimum signal level at system boundary in dBu (same as designed mean signal strength described above)

- *Antenna Height*—Height Above Average Terrain (HAAT) surrounding the antenna site

- *Effective Radiated Power (ERP)*— Product of the power supplied to the antenna and its gain relative to a half wave dipole

- *Environment Type*—The Okumura/Hata method uses four different classifications to describe terrain. These classifications are urban, suburban, quasi-open, and open (see Section C.4.5 for definition).

**Carey Propagation Curves.** Eight regions use Carey propagation curves as guides to determine system coverage areas, even though the APCO packing program uses the Okumura/Hata method. Data tables taken from Carey propagation curves are included in each plan, along with formulas and methods for determining service areas and co-channel interference.

**Annexation and Other Expansions.** Group I includes recommendations regarding expansion of jurisdictions. If a system needs to be expanded, the increased range will be determined at the time of modification. If it is found that interference with another system is likely, alternate methods of expansion, such as satellite systems, will be required.

**System Loading.** Groups I, IV, and V use the following requirements for NPSPAC channel loading:

- *Conventional Systems*—Entities requesting one channel to replace a channel they are giving back for reassignment will not be required to meet loading requirements to

obtain that channel. However, if the system is not loaded to 50 or more units (70 for group IV) within 3 years, that frequency will be available to other entities on a shared basis.

- *Trunked Systems or Requests for Multiple Channels*—Entities requesting channels must comply with the loading tables provided in the plan. These loading tables are given in terms of emergency and non-emergency channels.

Four other regions also include loading requirements, but instead of using the standards above, they simply state that conventional systems shall comply with FCC Rules and Regulations, Part 90.633, and that trunked systems shall comply with Part 90.631. Group III uses existing loading standards, which are as follows: 70 units per conventional channel, 100 units per trunked channel and conventional data channel, and 150 units per trunked data channel.

**Traffic Loading Study.** Group I and a few other regions require justification of additional channels through a traffic loading study. The study must show "air-time" usage during the peak busy hours greater than 70 percent per channel on 3 consecutive days to justify additional channels. Alternatively, Region 25 uses the Grade of Service (GOS) method to justify additional frequencies. The GOS is a measure of the probability that a communication channel is available. Additional frequencies may be allowed if the following conditions exist:

- The GOS is less than 0.85 at peak busy hour (PBH).
- The GOS is less than 0.92 at the bouncing busy hour (BBH).
- The GOS is less than 0.95 at the time consistent busy hour (TCBH).

**Federal S160 Agreements.** Group III and a few other regions allow entities that support interoperability by permitting federal use of their frequencies through S160 agreements to augment channel requirements by 2 percent because of increased radio usage.

**Encryption Standards (Groups II and IV).** Groups II and IV include standards dealing with encryption. Encryption is encouraged for entities in covert operations, and these groups recommend techniques that produce high levels of communications security and decoded voice recognition. No form of encryption is allowed on the National Calling Channel. Encryption is recommended on the Tactical Channels; however, compatible equipment must be provided by the agency requiring such encryption.

**Use of Cellular (Groups II, III, IV, Region 31).** Group II does not recommend the use of automatic interconnection to the PSTN using 800 MHz radios because this interconnection requires significantly longer channel use time. Instead, cellular telephone usage is recommended for connection to the PSTN, especially in situations requiring one-on-one communications between a mobile and telephone user. Region 31's plan is similar, except it makes no mention of cellular telephones as an alternative.

Group III discusses cellular radio technology as a future alternative for trunked radio for public safety use. The plan cautions users that any proposal of cellular radio as an alternative to a

trunked radio system must demonstrate that cellular radio can provide the same or a greater degree of spectrum efficiency as trunking and it can handle emergency situation communications. Group IV simply recommends the use of cellular telephones for non-emergency connection to the PSTN.

**Expansion of Existing Systems.** All groups, except group III, state existing systems that will be expanded to include the NPSPAC channels will have their mobile radios "grandfathered," if the modifications conform with the *National Plan MO&O,* FCC Docket 87-112. This primarily involves reducing the modulation deviation to +/- 4 kHz. Existing base stations in the 806–821/851–866 MHz band may *not* be used in the NPSPAC bands.

Many of the regions in group I exclude the statement about modulation deviation reduction to +/- 4 kHz. Region 5 allows radio equipment that is type accepted for operation in the 806–821/851–866 frequency band to operate indefinitely on the National Common Channels, with a maximum permissible modulation deviation of +/- 5 kHz. Region 6 also allows other 800 MHz equipment to be used on the five common channels, but only for mutual aid purposes.

**Slow Growth (Groups I, III, IV, and V).** All groups except group II include provisions for slow growth. Groups I, III, IV, and V require that all systems in the NPSPAC bands under the regional plan be slow growth, in accordance with Part 90.629 of the FCC's Rules and Regulations. These rules allow those requesting frequencies to take up to five years to construct a system. In addition, Region 7 requires compliance with Part 90.631 and Part 90.633. Region 40 requires compliance with Part 90.62e of the FCC's Rules and Regulations.

**Transmitter Time-Out Timers.** Region 30 includes the following section on transmitter time-out timers:

> "Any communications plan which requires the development of multiple base station with capability on one or more common channels, carries associated risks. Pursuant to this plan, within this region, transmitter 'time-out timers' will be required on all transmitters."[6]

**Frequency Reuse.** Several regions within group IV chose to maximize the use of the NPSPAC frequencies. Therefore, the regions state that any agency's proposed system should be modified to increase frequency reuse. These modifications include antenna design, transmitter power, transmitter location, and frequency assignments.

Regions 3, 4, 34, 18, and 40 handled the frequency reuse issue differently. These regions propose that adherence to the technical design requirements of the plan will result in maximum co-channel use within the region, and adjacent channel considerations should be similar to co-channel considerations because of the close proximity of adjacent channels. Furthermore, applicants must show that their proposed systems will not interfere with any existing co-channel system and will provide an existing-to-proposed signal margin of greater than 35 dBu at the

6 *Region 30 Public Safety Plan*

existing system's coverage area boundary. Each of these regions has a section called "Adjacent Channel Design" that follows the section on frequency reuse in their plan. This section states that systems must be designed to have no interference with adjacent channels. The method of determining adjacent channel interference is the same as for the co-channel case, outlined elsewhere in the plan (generally in the Frequency Reuse section), except that the existing-to-proposed signal margin will be reduced to 15 dBu. These numbers are included in the Interference Protection Ratios subsection of the Frequency Sorting Methodology section of this appendix.

Regions 35 and 43 are similar to those mentioned above, but their method of determining interference is different than the existing-to-proposed signal level. These regions state that the proposed co-channel signal level must not exceed 5 dBu, and the proposed adjacent channel signal level must not exceed 25 dBu at any point within the service area of an existing system. These signal levels are included in the Spectrum Allocations and Frequency Assignment Statistics section in this appendix.

**Control Stations.** Eleven regions limit the received signal strength of control stations to no more than 6 dBu above that of a mobile unit on the system at its outer boundaries. Criteria concerning control stations must be included in the frequency applications. Regions 23, 49, 50, and 52 also discuss using control stations as system backups, with minor modifications in some applications to avoid interference.

Region 3 requires control/base stations to conform to the radio service area 41 dBu boundary requirement.[7] Region 20 requires control stations to use directional antennas located within the service area with a received signal strength at the repeater of less than 20 dBu above receiver quieting (20 dBq). Criteria concerning control stations must be included in frequency applications. Region 42 has similar requirements but does not include the 20 dBu requirement.

**Adjacent Channel Interference (Group V).** Group V and several other regions state that, where co-channel and adjacent channel systems are separated by a certain distance, the interference studies required elsewhere in the plan are unnecessary. This distance is 50 miles for Regions 4 and 40, and 70 miles for Region 3. Region 18 has a similar statement but requires 100 miles for co-channel systems and 50 miles for adjacent channel systems. Region 1 requires at least 20 miles of separation between adjacent channel systems. Also, the co-channel separation of 70 miles may require modification to prevent interference but will be held to 70 miles where reasonable. This separation will be determined by a number of factors at the time of application. Region 26 states that co-channel separation will not be held to 70 miles but will be determined be a number of factors. Region 26 also states that system tests and studies should be performed to establish minimum separation distances.

**Aircraft to Ground Communication.** Group III restricts the use of 800 MHz radio in aircraft. Air-to-ground transmissions are limited to a maximum ERP of 1 watt (0 dBW). No transmissions on area channels are allowed above 2,000 feet above ground level (AGL), and no transmissions

[7] *Region 3 Public Safety Plan*

are allowed above 3,000 feet AGL on wide-area Mutual Aid Channels. Several regions do not mention AGL distances, and Region 3 limits ERP to 3 watts (4.8 dBW).

**Satellite Receivers.** Region 22 recommends the use of "satellite receivers" to boost the talk-back of low powered transmitters.

**Satellite Services.** Regions 45 and 54 suggest the use of Mobile Satellite Service (MSS) during major disasters that require long-range communications. However, the plans state that this service should be restricted to frequencies above 960 MHz.

### C.5.6 Frequency Assignment Process

The last several sections of each regional plan typically provide information about the assignment process and the regional plan review process.

**Application, Assignment, and Review Process.** Group II includes a flow chart to illustrate the application, evaluation, and assignment process. This process includes a filing window for submitting applications, an evaluation matrix for prioritizing the applicants, and a process for assigning the frequencies.

**Additional Channel Assignments.** Many regions manage frequency assignments by allotting a defined minimum number of channel pairs per county for counties with populations below a certain level (e.g., two channel pairs per county). The counties with higher population are allotted one channel for each additional increment of population (e.g., counties above 20,000 receive one channel pair for each additional 20,000 citizens). This method provides a basis for the initial frequency assignment.

**Frequency Sorting Methodology (Groups I, II, III, and V).** Most groups and regions use a frequency sorting program from APCO to assign frequencies. This program has a high degree of spectrum efficiency and a low probability of co-channel and adjacent channel interference. Groups I and III also include the factors that contribute to the assignment created by the APCO/CET program. Group I included these factors, as listed below, in a section entitled "Initial Frequency Assignment."

- *Geographic area.* The geographic area is defined as one or more circles of equal radius. These circles should ideally include an applicant's entire jurisdiction area but should not exceed the jurisdiction boundary by 3 miles.

- *Environment.* The environment is defined by the Okumura/Hata method of classification.

- *Blocked channels.* The five National Common Channels and any other regionwide channels that are spaced at 0.5 MHz intervals and excluded from the frequency sort.

- *Transmitter combining.* The program provides a minimum frequency separation between channels assigned at the same site to enable efficient combining of multiple transmitters to a single antenna.

- *Special Considerations.* Licensees planning to expand systems that are unable to operate on 12.5 kHz separated carrier frequencies may operate on only even-numbered channels.

- *Interference protection ratios.* There are two interference protection ratios built into the computer program. The co-channel ratio gives the desired-to-undesired signal ratio (in dBu) for co-channel assignments, and the adjacent channel ratio gives the same for adjacent channel assignments. These numbers were different for each region because they depend on such factors as geography and population. The co-channel ratio ranged from 35 to 40 dBu and the adjacent channel ratio was 15 dBu in most cases.

- *Adjacent Region Considerations (Group I Only).* The program requires a listing of channels to be blocked because of use by adjacent regions.

**Spectrum Allocations and Frequency Assignment Statistics.** In addition to the normal spectrum allocation table and channel assignments, many regions assign other regional channels and some include other assignment statistics with the tables—

- *Regional Mutual Aid Channels*: Many regions implemented other mutual aid channels in addition to the five NPSPAC channels.

- *Regional Non-Mutual Aid Channels.*

- *Statewide Allocations*.

Group I and various other regions include the following frequency assignment statistics with their plans:

- Maximum field strength for co-channel operation in dBu (also included in groups III and IV). This field strength must not exceed 5 dBu.

- Maximum field strength for adjacent operation in dBu (also included in groups III and IV). This field strength must not exceed 25 dBu.

- Total number of channels assigned (also in group III).

- Total number of unassigned channels (also in group III).

- Total number of reserved channels.

- Total number co-channels assigned.

**Expansion of Initial Assignment.** Group I provides for the depletion of channels for any county. The regional review committee can then take action to assign more channels to that county, if frequencies are available. The county or agency must resubmit any appropriate licensing forms.

**Unused Spectrum.** Groups I and II require that any unused frequencies be returned to a reserve pool. These channels will be used to resolve conflicts with adjacent regions and fill any additional needs.

**Frequency Recall.** Groups II and IV include, in the frequency assignment process, a provision to monitor the progress of entities in implementing systems using the newly assigned frequencies. If no progress is made in implementing these entities' systems, the agencies are then warned of the consequences of not progressing. Subsequently, if progress is still not being made, the committee may notify the FCC and an entity's license may be revoked.

**Appeal Process (All Groups).** All plans include an appeal process, but they vary by region. For many of the regions, the appeal process has two levels: The regional review committee and then the FCC. If an appeal reaches the FCC, its decision will be final. In many regions, the first level of the process is APCO rather than the regional review committee. Two other regions have a three-level appeal process: review committee, National APCO, and then the FCC.

## C.6 Submittal and Review of Regional Plans

The first regional plan was submitted by Region 8 in September 1988. The final regional plan was submitted for approval by Region 47 in December 1993. The detailed description provided in the previous sections describes the content of the regional plans submitted within this time frame. By examining the contents of the regional plans and the demographics of the regional committees, this appendix provides a limited view of the regional planning process, which took place over the five years between 1988 and 1993. However, to view the entire process, it is also necessary to examine any activity that occurred after the submission and approval of a regional plan.

In the National Plan, the FCC recommended rules and regulations to govern not only the regional plan approval process, but also the plan amendment process for regional plans that had already been approved. However, after the vast majority of regional plans were approved, the FCC reiterated its amendment policy in a *Regional Public Safety Plan Handbook* issued in August 1997. This handbook reiterated the following points concerning the amendment policy:

- "Applications for amendment to public safety plans should include an original and five copies, and should be forwarded by the regional planning Chairman to the Secretary, Federal Communications Commission, Washington, D.C. 20554."

- "Requests for amendments revising allocation of frequency spectrum must be coordinated with adjoining regions."

- "Regions should promptly notify the FCC when a new regional chairman is appointed . . . including the date the new Chairman was elected . . ."

- "Comments or reply comments to regional plan amendments should include an original and five copies and be forwarded to the Secretary, Federal Communications Commission, Washington, D.C. 20554."

The FCC reiterated these requirements to ensure timely processing of all amendment applications and stated that any application that does not follow these guidelines will be returned as deficient. The FCC also advised all applicants to adhere to the regulations and guidelines recommended in the National Plan.

## C.7 Regional Plan Docket History

When regional plans were received, the FCC assigned a docket number to each plan for internal tracking purposes. The FCC uses the docket numbering system to track the evolution of each regional plan. Tables C-11 through C-16, organized by regional group numbers, provide a docket history for each of the regional plans. The tables include the date of submittal of the regional plan, the date the public notice was issued by the FCC, the date the *National Plan R&O* adopting the regional plan was issued, and a brief description of any actions that have taken place since the plan's approval. Although most of the dockets were reviewed in producing these tables, several dockets could not be obtained. Therefore, those regions with incomplete docket histories are designated as such.

**Table C-11**
**Docket History of Group I Regional Plans**

| REGION NUMBER | DOCKET NUMBER | DATE SUBMITTED | DATE OF PUBLIC NOTICE | DATE OF ORDER | ACTION TAKEN AFTER APPROVAL OF REGIONAL PLAN |
|---|---|---|---|---|---|
| 2 | PR 93-81 | 01/27/93 | 03/23/93 | 06/02/93 | |
| 10 | PR 92-189 | 01/15/92 | 08/11/92 | 10/09/92 | |
| 11 | PR 93-80 | 01/01/92 | 03/22/93 | 02/07/94 | |
| 12 | PR 93-149 | XX/XX/XX | 05/28/93 | 08/03/93 | 11/18/93 - Amendment |
| 15 | PR 92-288 | 06/23/92 | 11/27/92 | 02/10/93 | 02/03/94 - Amendment |
| 17 | PR 93-132 | 01/20/93 | 05/05/93 | 07/28/93 | |
| 22 | PR 93-130 | 12/01/92 | 05/05/93 | 07/12/93 | |
| 23 | GN 89-478 | 01/06/93 | 10/26/89 | 01/10/90 | |
| 24 | PR 93-131 | 01/20/93 | 05/05/93 | 07/12/93 | |
| 25 | PR 92-267 | 05/18/92 | 11/09/92 | 01/12/93 | |
| 29 | PR 93-86 | 02/04/93 | 03/26/93 | 06/02/93 | incomplete docket history |
| 32 | PR 93-77 | 11/12/91 | 03/19/93 | 06/02/93 | |
| 37 | PR 93-78 | 01/27/93 | 03/19/93 | 06/02/93 | |
| 38 | PR 93-57 | 12/29/92 | 03/12/93 | 05/14/93 | |
| 39 | PR 93-58 | 01/14/93 | 03/12/93 | 05/14/93 | |
| 44 | PR 93-79 | 01/13/93 | 03/22/93 | 06/02/93 | |

| REGION NUMBER | DOCKET NUMBER | DATE SUBMITTED | DATE OF PUBLIC NOTICE | DATE OF ORDER | ACTION TAKEN AFTER APPROVAL OF REGIONAL PLAN |
|---|---|---|---|---|---|
| 47 | PR-93-82 | 12/27/93 | 03/23/93 | 06/02/93 | |
| 48 | PR 93-105 | 01/22/93 | 04/08/93 | 06/15/93 | 07/13/95 - Comments received from Anchorage Amateur Radio |
| 49 | PR 92-190 | 01/01/92 | 08/18/92 | 11/06/92 | incomplete docket history |
| 50 | PR 92-286 | 08/05/92 | 11/27/92 | 02/10/93 | incomplete docket history |
| 52 | PR 92-1 | 11/12/91 | 01/03/92 | 03/18/92 | incomplete docket history |
| 53 | PR 92-169 | 02/27/92 | 07/28/92 | 10/02/92 | |

## Table C-12
## Docket History of Group II Regional Plans

| REGION NUMBER | DOCKET NUMBER | DATE SUBMITTED | DATE OF PUBLIC NOTICE | DATE OF ORDER | ACTION TAKEN AFTER APPROVAL OF REGIONAL PLAN |
|---|---|---|---|---|---|
| 8 | GN 88-476 | 09/22/88 | 09/29/88 | 05/12/89 | 07/03/89 - Present: Numerous comments and amendments were received during this period |
| 19 | GN 90-53 | 10/04/89 | 02/12/90 | 04/26/90 | 03/21/97 - Amendment<br>06/26/97 - Application filing window opened |
| 28 | GN 89-573 | 09/29/89 | 12/07/89 | 12/16/93 | 06/28/96 - Present: Numerous comments received from Region 20<br>05/01/97 - Application filing window opened |
| 30 | GN 90-394 | 05/01/90 | 08/29/90 | 05/24/91 | incomplete docket history |
| 34 | PR 92-171 | 03/17/92 | 08/03/92 | 10/06/92 | |
| 36 | PR 92-274 | 10/05/92 | 11/18/92 | 02/01/93 | 6/18/97 - Public Notice for Reorganization |
| 55 | PR 92-287 | 05/12/92 | 11/27/92 | 02/10/93 | 5/15/97 - Public Notice for filing window |

## Table C-13
## Docket History of Group III Regional Plans

| REGION NUMBER | DOCKET NUMBER | DATE SUBMITTED | DATE OF PUBLIC NOTICE | DATE OF ORDER | ACTION TAKEN AFTER APPROVAL OF REGIONAL PLAN |
|---|---|---|---|---|---|
| 13 | PR 91-228 | 03/07/91 | 07/31/91 | 09/30/91 | 08/25/94 - Amendment |
| 14 | GN 90-17 | 11/21/89 | 03/21/90 | 05/30/90 | incomplete docket history |
| 45 | PR 92-273 | 08/14/92 | 11/18/92 | 06/02/93 | 12/28/92 - Comments received from Region 22 |
| 54 | GN 89-363 | 07/14/89 | 08/17/89 | 12/05/89 | 03/28/91 - Comments received concerning reallocation of frequencies<br>06/24/97 - Application filing window opened |

## Table C-14
## Docket History of Group IV Regional Plans

| REGION NUMBER | DOCKET NUMBER | DATE SUBMITTED | DATE OF PUBLIC NOTICE | DATE OF ORDER | ACTION TAKEN AFTER APPROVAL OF REGIONAL PLAN |
|---|---|---|---|---|---|
| 7 | GN 89-452 | 08/02/89 | XX/XX/XX | XX/XX/XX | incomplete docket history |
| 16 | PR 91-162 | 02/26/91 | 06/12/91 | 08/08/91 | |
| 46 | PR 91-59 | 10/26/90 | 03/12/91 | 05/20/91 | incomplete docket history |

## Table C-15
## Docket History of Group V Regional Plans

| REGION NUMBER | DOCKET NUMBER | DATE SUBMITTED | DATE OF PUBLIC NOTICE | DATE OF ORDER | ACTION TAKEN AFTER APPROVAL OF REGIONAL PLAN |
|---|---|---|---|---|---|
| 3 | PR 91-143 | 03/08/91 | 05/16/91 | 09/04/91 | incomplete docket history |
| 4 | PR 93-3 | 10/05/88 | 01/13/93 | 03/18/93 | incomplete docket history |
| 21 | GN 90-221 | 06/26/91 | 04/17/90 | 06/22/90 | incomplete docket history |
| 40 | GN 88-549 | 10/05/88 | 12/07/88 | 06/22/89 | 09/05/89 - Submission of revision<br>07/09/90 - Submission of revision<br>01/07/93 - Submission of revision |

## Table C-16
## Docket History of Group VI Regional Plans

| REGION NUMBER | DOCKET NUMBER | DATE SUBMITTED | DATE OF PUBLIC NOTICE | DATE OF ORDER | ACTION TAKEN AFTER APPROVAL OF REGIONAL PLAN |
|---|---|---|---|---|---|
| 1 | GN 90-280 | 01/23/90 | 05/23/90 | 08/01/90 | incomplete docket history |
| 5 | GN 89-97 | XX/XX/XX | 04/27/89 | 11/08/89 | 12/22/89 - 02/28/95: Numerous comments and amendments submitted |
| 6 | GN 90-287 | 11/29/90 | 05/29/90 | 11/20/90 | 06/12/92 - 10/31/94: Numerous comments and amendments submitted |
| 9 | GN 90-119 | 11/15/89 | 03/05/90 | 03/23/94 | 10/28/94 - Present: Amendments submitted and approved |
| 18 | GN 90-498 | 07/20/90 | 10/17/90 | 12/19/90 | 07/13/93 -Present: Amendments submitted, still pending |
| 20 | GN 90-7 | 11/15/89 | 01/17/90 | 02/10/94 | 09/01/94 - Present: Numerous comments regarding Region 28 Plan |
| 26 | GN 89-608 | 07/16/91 | 12/18/89 | 10/23/91 | incomplete docket history |
| 27 | PR 92-268 | 05/15/92 | 11/09/92 | 01/12/93 | 05/23/93 - Amendment |
| 31 | PR 93-150 | 03/09/93 | 05/28/93 | 08/03/93 | |
| 33 | PR 91-258 | 02/10/89 | 08/30/91 | 02/06/92 | incomplete docket history |
| 35 | PR 92-269 | 06/15/92 | 11/09/92 | 01/12/93 | incomplete docket history |
| 41 | PR 91-282 | 06/24/91 | 09/27/91 | 11/27/91 | |
| 42 | PR 91-300 | 02/27/91 | 10/09/91 | 12/11/91 | incomplete docket history |
| 43 | PR 91-270 | 05/01/91 | 09/12/91 | 11/15/91 | 08/23/94 - Amendment |

## C.8 Status of Regional Committees Today

The last column of each table, labeled "Action Taken After Approval of Regional Plan," highlights those regional committees that have remained active since the process began. An examination of these tables reveals that although many of the regional committees have not remained active since their plan's approval, some regions have remained extremely active. Groups II and VI, for instance, have, in large part, remained very active. Regions 5, 6, 8, 9, 18, 20, and 28 have had very active docket histories from the beginning of the process to the present day. Many of these active regions contain large municipalities where additional spectrum is a valuable commodity. This high value may account for the high activity witnessed within these regions. Much of these regions' docket histories involve receiving comments aimed at acquiring additional spectrum for public entities not originally considered within the regional plan. Many of the docket histories also involve submitting amendments to the approved regional plans.

In reviewing the data as a whole, it appears, however, that most regional committees became largely inactive after their associated regional plans were approved. Several regions submitted minor amendments to the regional plans, but these amendments were very limited in scope and once these amendments were approved, no further activity occurred. The perception in these regions appears to be that regional committees were formed only to produce regional plans. Because, in these cases, very few comments were received regarding the regional plans after their approval, the regions could not justify continuing the regional committees process.

## C.9 Summary of the Regional Planning Process

The policies and technical standards proposed in the National Plan represent a new scheme by which the FCC could manage the newly allocated 800 MHz spectrum for use by the public safety community. By empowering regions throughout the country, the FCC involved state and local public safety entities in the spectrum management process. Many of the comments and suggestions proposed by the public safety community were used in developing the regulations that comprised the National Plan.

The National Plan became the template for each regional committee to use in developing their own regional spectrum management plan. These regional committees were required to adhere to the high-level requirements proposed in the National Plan but were given the freedom to determine system-specific requirements to meet local needs within a region. Regional committees acted as local extensions of the FCC in that each committee developed its own spectrum management plan and was tasked to ensure that this plan was carried out. The FCC acted as the oversight body of the entire process.

However, after the development and approval of a region's plan, the regional committees typically disbanded or became inactive. This level of inactivity tended to undermine the general feeling of the National Plan's success. Those committees that became inactive were not overseeing the local management process they had developed and proposed in the regional plan. Therefore, it appears regional committees were formed merely to develop a regional plan so the region would be granted licenses to operate in the newly allocated spectrum band. Thus, the actual goals of most regional committees may have undermined the entire National Plan process. This process, however, focused national attention on the inherent problems with the public safety

community's communications system and the spectrum management process used to govern the assignment of these frequencies.